



CONSORTIUM

Connecting internet apps to emergency services

PEMEA Cellular Network Info

PEMEA-CONS-CNI

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Cellular Network Information for PEMEA

1. Introduction

PEMEA was originally designed to allow mobile emergency applications to roam across Europe and uses the IETF PIDF-LO [R.2] for location representation and cellular network identifiers from the HELD measurements specification RFC 7105 [R.3].

However, when RFC 7105 was published in 2014, 3G was the dominant cellular technology, 4G was being rolled out, and 5G cellular representations were not available. Since this time 5G is rapidly rolling out, so that is a need for applications using this access technology to be able to provide available information through the PEMEA network to the relevant PSAP.

Further to this, at the time of writing, mobile phone operating systems almost exclusive blocked network information at the cell-level, leaving on MCC and MNC values available. Consequently, PEMEA made direct reference to the *network* element from RFC 7105, which, either provided the MCC, MNC applicable to 3GPP mobile networks, or the NID applicable to CDMA networks. So, an explicit type for 2G, 3G and 4G was not provided for.

This document, reuses types from RFC 7105 where it can, but defines explicit types for 2G, 3G, 4G and 5G networks, each in their own namespace. The value of this is that when 6G comes along, a new type is simply defined to cater for its network measurements.

The new elements defined in this document are conveyed in the *accessData* element of the PEMEA EDS message, defined Clause 10.3.14 in TS 103 478 [R.1].

2. Terms and Definitions

The following terms and definitions are used in this document:

3GPP	3rd Generation Partnership Project
AP	Application Provider
ASP	Aggregating Service Provider
CDMA	Code-Division Multiple-Access
CID	Cell ID
EDS	Emergency Data Send
EMTEL	Emergency Communications
ETSI	European Telecommunications Standards Institute
GSM	Global System for Mobile communications
HELD	HTTP-Enabled Location Delivery
IETF	Internet Engineering Task Force
LAC	Location Area Code
MCC	Mobile Country Code
MNC	Mobile Network Code
NCI	NR Cell Identity
NID	Network Identifier
NR	New Radio
PEMEA	Pan-European Mobile Emergency Application

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PIDF-LO	Presence Information Data Format Location Object
PIM	PSAP Interface Module
PSAP	Public Safety Answering Point
PSP	PSAP Service Provider
RFC	Request for Comments
TS	Technical Specification
XML	eXtensible Markup Language
XSD	XML Schema Definition

3. Approach

3.1 Overview

RFC 7105 defines a *cell:typeType* which was an enumeration of the different types of cellular technology at the time. This listed the technology name, for example *gsm*, rather technology type, such as *2G*. So, while the type values for *mcc* and *mnc* and others for the 2G, 3G and 4G technologies are reused, the technology names are not.

A new namespace and schema are defined for each technology type, and this can be extended as required for future technology evolutions.

The general structure for each set of cellular measurements is:

- Technology type: Constant token for that schema
- MCC from RFC 7105 cell schema
- MNC from RFC 7105 cell schema

3.2 2G Representation

A 2G cell-id in the 3GPP technology set is comprised of the following information fields, and each has a definition with the cell schema defined in RFC 7105.

Field Name	Type
network	Contant token "2G"
mcc	cell:mccType
mnc	cell:mncType
lac	cell:cellIdType
cid	cell:cellIdType

The schema for the 2G representation is contained in ANNEX A

```
<cell2g xmlns="urn:pemea:consortium:xml:ns:cellnetworks:cell2g">
  <network>2G</network>
  <mcc>465</mcc>
  <mnc>06</mnc>
  <lac>16383</lac>
  <cid>32767</cid>
</cell2g>
```

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3.3 3G Representation

A 3G cell-id in the 3GPP technology set is comprised of the following information fields, and each has a definition with the cell schema defined in RFC 7105.

Field Name	Type
network	Content token "3G"
mcc	cell:mccType
mnc	cell:mncType
rnc	cell:cellIdType
cid	cell:cellIdType

The schema for the 3G representation is contained in ANNEX B

```
<cell3g xmlns="urn:pemea:consortium:xml:ns:cellnetworks:cell3g">
  <network>3G</network>
  <mcc>465</mcc>
  <mnc>06</mnc>
  <rnc>2000</rnc>
  <cid>65000</cid>
</cell3g>
```

3.4 4G Representation

A 4G cell-id in the 3GPP technology set is comprised of the following information fields, and each has a definition with the cell schema defined in RFC 7105.

Field Name	Type
network	Content token "4G"
mcc	cell:mccType
mnc	cell:mncType
eucid	cell:cellIdType

The schema for the 4G representation is contained in ANNEX C.

```
<cell4g xmlns="urn:pemea:consortium:xml:ns:cellnetworks:cell4g">
  <network>4G</network>
  <mcc>465</mcc>
  <mnc>06</mnc>
  <eucid>80936424</eucid>
</cell4g>
```

3.5 5G Representation

A 5G cell-id in the 3GPP technology set is comprised of the following information fields, with the MCC and MNC definitions coming from RFC 7105.

Field Name	Type
network	Content token "5G"
mcc	cell:mccType
mnc	cell:mncType

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nci	cellId5NRType
-----	---------------

The schema for the 4G representation is contained in ANNEX D

```
<cell5g xmlns="urn:pemea:consortium:xml:ns:cellnetworks:cell5g">
  <5g:network>5G</5g:network>
  <5g:mcc>465</5g:mcc>
  <5g:mnc>06</5g:mnc>
  <5g:nci>687194767</5g:nci>
</cell5g>
```

4. Conveyance

The element defined in this document are conveyed in the *accessData* element of the EDS from the AP to the PIM but may be used for routing in the PSP and ASP nodes.

The *accessData* element is defined as a sequence and has an extension point that allows the inclusion of new elements from different namespaces. Each of the schemas defined in this document has its own namespace and is therefore uniquely distinguishable and able to be included in the *accessData* element as shown in the following 5G example.

```
<emergencyDataSend xmlns="urn:pemea:apps:xml:ns:pemea:base"
  xmlns:pdf="urn:ietf:params:xml:ns:pdf"
  xmlns:gp="urn:ietf:params:xml:ns:pdf:geopriv10"
  xmlns:gml="http://www.opengis.net/gml"
  xmlns:gs="http://www.opengis.net/pidf/1.0"
  xmlns:cell="urn:ietf:params:xml:ns:geopriv:lm:cell"
  xmlns:cell5g="urn:pemea:consortium:xml:ns:cellnetworks:cell5g"
  xmlns:con="urn:ietf:params:xml:ns:geopriv:conf"
  ttl="5"
  onErrorPost="https://cooAP.example.com.be:2001/pemea/error/CoolAP-7496"
  onCapSupportPost="https://cooAP.example.com.be:2001/pemea/cap/CoolAP-7496">
  ...
  <accessData>
    <cell5g:cell5g>
      <cell5g:network>5G</cell5g:network>
      <cell5g:mcc>465</cell5g:mcc>
      <cell5g:mnc>06</cell5g:mnc>
      <cell5g:nci>687194767</cell5g:nci>
    </cell5g>
  </accessData>
  ...
</emergencyDataSend>
```

5. References

5.1 Normative References

- [R.1] [“Emergency Communications \(EMTEL\); Pan-European Mobile Emergency Application”, ETSI TS 103 478 V1.1.1 \(2018-03\).](#)
- [R.2] [“Presence Information Data Format Location \(PIDF-LO\)”, IETF RFC 4119](#)

- [R.3] [“Using Device-Provided Location-Related Measurements in Location Configuration Protocols”](#), IETF RFC 7105, January 2014.

5.2 Informative References

N/A

ANNEX A 2G Schema

```
<?xml version="1.0"?>
<xs:schema
  xmlns:cell2g="urn:pemea:consortium:xml:ns:cellnetworks:cell2g"
  xmlns:cell="urn:ietf:params:xml:ns:geopriv:lm:cell"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  targetNamespace="urn:pemea:consortium:xml:ns:cellnetworks:cell2g"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified">

  <xs:annotation>
    <xs:appinfo
      source="urn:pemea:consortium:xml:ns:cellnetworks:cell2g">
    </xs:appinfo>
    <xs:documentation
      source="Cellular Network Information for PEMEA">
      This schema defines a set of cellular location measurements for 2G networks.
    </xs:documentation>
  </xs:annotation>

  <xs:simpleType name="identifier">
    <xs:restriction base="xs:token">
      <xs:pattern value="2G"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="cellType2g">
    <xs:complexContent>
      <xs:restriction base="xs:anyType">
        <xs:sequence>
          <xs:element name="network" type="cell2g:identifier"/>
          <xs:element name="mcc" type="cell:mccType"/>
          <xs:element name="mnc" type="cell:mncType"/>
          <xs:element name="lac" type="cell:cellIdType" minOccurs="0"/>
          <xs:element name="cid" type="cell:cellIdType" minOccurs="0"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:element name="cell2g" type="cell2g:cellType2g"/>
</xs:schema>
```

ANNEX B 3G Schema

```
<?xml version="1.0"?>
<xs:schema
  xmlns:cell3g="urn:pemea:consortium:xml:ns:cellnetworks:cell3g"
  xmlns:cell="urn:ietf:params:xml:ns:geopriv:lm:cell"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  targetNamespace="urn:pemea:consortium:xml:ns:cellnetworks:cell3g"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified">

  <xs:annotation>
    <xs:appinfo
      source="urn:pemea:consortium:xml:ns:cellnetworks:cell3g">
    </xs:appinfo>
    <xs:documentation
      source="Cellular Network Information for PEMEA">
      This schema defines a set of cellular location measurements for 3G networks.
    </xs:documentation>
  </xs:annotation>

  <xs:simpleType name="identifier">
    <xs:restriction base="xs:token">
      <xs:pattern value="3G"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="cellType3g">
    <xs:complexContent>
      <xs:restriction base="xs:anyType">
        <xs:sequence>
          <xs:element name="network" type="cell3g:identifier"/>
          <xs:element name="mcc" type="cell:mccType"/>
          <xs:element name="mnc" type="cell:mncType"/>
          <xs:element name="rnc" type="cell:cellIdType" minOccurs="0"/>
          <xs:element name="cid" type="cell:cellIdType" minOccurs="0"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:element name="cell3g" type="cell3g:cellType3g"/>
</xs:schema>
```

ANNEX C 4G Schema

```
<?xml version="1.0"?>
<xs:schema
  xmlns:cell4g="urn:pemea:consortium:xml:ns:cellnetworks:cell4g"
  xmlns:cell="urn:ietf:params:xml:ns:geopriv:lm:cell"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  targetNamespace="urn:pemea:consortium:xml:ns:cellnetworks:cell4g"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified">

  <xs:annotation>
    <xs:appinfo
      source="urn:pemea:consortium:xml:ns:cellnetworks:cell4g">
    </xs:appinfo>
    <xs:documentation
      source="Cellular Network Information for PEMEA">
      This schema defines a set of cellular location measurements for 4G networks.
    </xs:documentation>
  </xs:annotation>

  <xs:simpleType name="identifier">
    <xs:restriction base="xs:token">
      <xs:pattern value="4G"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="cellType4g">
    <xs:complexContent>
      <xs:restriction base="xs:anyType">
        <xs:sequence>
          <xs:element name="network" type="cell4g:identifier"/>
          <xs:element name="mcc" type="cell:mccType"/>
          <xs:element name="mnc" type="cell:mncType"/>
          <xs:element name="eucid" type="cell:cellIdType" minOccurs="0"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:element name="cell4g" type="cell4g:cellType4g"/>
</xs:schema>
```

ANNEX D 5G Schema

```
<?xml version="1.0"?>
<xs:schema
  xmlns:cell5g="urn:pemea:consortium:xml:ns:cellnetworks:cell5g"
  xmlns:cell="urn:ietf:params:xml:ns:geopriv:lm:cell"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  targetNamespace="urn:pemea:consortium:xml:ns:cellnetworks:cell5g"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified">

  <xs:annotation>
    <xs:appinfo
      source="urn:pemea:consortium:xml:ns:cellnetworks:cell5g">
    </xs:appinfo>
    <xs:documentation
      source="Cellular Network Information for PEMEA">
      This schema defines a set of cellular location measurements for 5G networks.
    </xs:documentation>
  </xs:annotation>

  <xs:simpleType name="identifier">
    <xs:restriction base="xs:token">
      <xs:pattern value="5G"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:simpleType name="cellId5NRType">
    <xs:restriction base="xs:long">
      <xs:maxInclusive value="68719476735"/> <!-- 2^36 (nci) -->
      <xs:minInclusive value="0"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:complexType name="cellType5g">
    <xs:complexContent>
      <xs:restriction base="xs:anyType">
        <xs:sequence>
          <xs:element name="network" type="5g:identifier"/>
          <xs:element name="mcc" type="cell:mccType"/>
          <xs:element name="mnc" type="cell:mncType"/>
          <xs:element name="nci" type="cell5g:cellId5NRType" minOccurs="0"/>
        </xs:sequence>
      </xs:restriction>
    </xs:complexContent>
  </xs:complexType>

  <xs:element name="cell5g" type="cell5g:cellType5g"/>
</xs:schema>
```

6. HISTORY

Document history		
V1.0	June 2023	Initial Draft
V1.1	July 2023	Fix some errors in schemas